Front. Econ. China 2010, 5(1): 25–51
DOI 10.1007/s11459-010-0002-7

RESEARCH ARTICLE

Huayi Yu

China's House Price: Affected by Economic Fundamentals or Real Estate Policy?

Abstract Many theory and empirical literature conclude that house price can reflect economic fundamentals in the long-term. However, by using China's panel data of 35 main cities stretching from 1998 to 2007, we find that there is no stable relationship between house price and economic fundamentals. House price has deviated upward from the economic fundamentals since government started macro-control of the real estate market. We consider that the mechanism between the house price and economic fundamentals is distorted by China's real estate policy, especially its land policy. Meanwhile the policy itself is an important factor in explaining the changes of China's house price. Then we estimate the dynamic panel data model on house price and the variables which are controlled by real estate policy. The result shows: land supply has negative effects on house price; financial mortgages for real estate have positive effects on house price; and the area of housing sold and the area of vacant housing, which reflects the supply and demand of the housing market, has negative effects on house price. We also find some differences in house price influence factor between eastern and mid-western cities. Finally, we propose policy suggestions according to the empirical results.

Keywords house price, economic fundamental, real estate policy, dynamic panel data model

JEL Classification E31, R20, R31

1 Introduction

Ever since China's central government decided to stop welfare-housing

Received August 10, 2009

Huayi Yu (✉)
School of Economics, Renmin University of China, Beijing 100872, China
E-mail: rucyhy@gmail.com

distribution policy and started a comprehensive market-oriented reform in the housing distribution system in 1998, China's real estate market has developed rapidly. In just a few years, real estate has become one of the most important pillars of China's national economy. Like many other countries in the world, China also experienced a process of rapid rise in house price in the past few years, which was more obvious in some major cities. From 1997 to 2007, China's average house price increased by 52.57% and in most big cities the house price increased over 100%. In the meantime, the CPI only increased a cumulative 11.69%. Under this background, some literature started to discuss whether there may be a bubble in China's house price. But most of the housing-related literature measures the extent of China's house price bubble according to some ratios of house price and economic fundamentals, such as price and income ratio, mortgage costs and rent ratio, the ratio of real estate enterprise profit margins and social average profit margins, and so on.[1] However, using such ratios actually implies a presumption that China's house price has a certain quantitative relation to economic fundamentals. This triggers a problem: if China's house price is not decided by economic fundamentals, using such ratios of house price and economic fundamentals to judge the house price bubble is not sensible. In this paper, we consider whether China's house price reflects its economic fundamentals and, if so, what is the relationship between them? This paper will comprehensively discuss this issue in primary. In addition, we must take China's special way of operating a real estate market into account while studying China's house price. China's real estate market is not established on the basis of private land ownership. Thus the government can intervene with the real estate market frequently, and this policy of regulating the real estate market can be rather intense. It is for this reason that China's house price formation mechanism is so different from other countries that operate with private land ownership. Is the recent change in China's house price caused by China's real estate policy? What is the extent of the policy's influence on China's house price? These important issues have been previously discussed in housing-related literature, and various viewpoints have been propounded, however, there has neither been any profound theory analysis nor any empirical evidence on the matter. So in this paper, we will also conduct an empirical study about the influence of China's real estate policy on house price.

In the literature about house price, the discussion of the relationship of house price and economic fundamentals is prevalent. Most literature has found that economic fundamentals have good explanatory power in explaining changes in house price in many countries. Based on the US' data, Mankiw & Weil (1989)

[1] See Fu's (2005) review for detail.

found the demographic changes has important effect on the US house price in the 1970s and Capozza et al. (2002) found city size, real income growth, population growth, and real construction costs have stable relationship with house price in 62 MSAs (metropolitan statistical areas) from 1979 to 1995. Hort's (1998) research has the similar result to Capozza et al. (2002) using a 1968–1994 Swedish panel data. McQuinn & O'Reilly (2008) and Glindro et al. (2008) used a panel data of 16 OECD countries from 1980–2005 and 9 Asia-Pacific economies from 1993–2006 respectively, and found the long-run house price mainly reflects adjustment to improved fundamentals rather than speculative house price bubbles. However, we should notice that such empirical papers are all based on the countries with private land ownership system. Under this private land market adjustment mechanism, it is possible for house price to reflect economic fundamentals. But China is a country with a state-owned land system (rural land is collective ownership). The transfer and circulation of land ownership by individuals is forbidden, only the land-use right can be transfer and circulate through governmental plan. The power that Chinese government maintains to control the land supply is considerably strong, which is quite different from the countries with private land ownership.

Though Gallin (2006) basing on 95 US MSAs data from 1975–2002 and Mikhed & Zemčík (2007) basing on 22 US MSAs data from 1980–2006 concluded that there is no stable relationship between house price and economic fundamentals, which hints the regression of house price and economic fundamentals is likely spurious. These two papers did not give powerful explanation for the deviation of house price from economic fundamentals.

In aspect of explaining the house price deviating from economic fundamentals, some papers steer to the policy change: Muellbauer & Murphy (1997) found that UK's financial liberalization of the mortgage market in the 1980s led to notable shifts in the house price behavior and Priemus (2003) found that the change of land policy has significantly affected the house price in the Netherland. Kiyotaki & Moore (1997) and Bernanke et al. (1999) establish a theory analysis framework on financial system credit and asset prices (including house price) emphasizing the role of banking credit to house price. However, judging from the empirical literature, huge differences exist among the impact of credit to house price in different areas. Collyns & Senhadji (2002) found the influence of credit growth to residential property price is contemporaneously significant in many Asian economies. But Goodhart (1995) found the relationship between property prices and credit growth is different in the US from in the UK. Gerlach & Peng (2005) found that the influence direction is from property prices to bank credit rather than from bank credit to property prices.

In discussing the issue of China's house price, Zhang et al. (2006) and Liang

& Cao (2007) found that the correlation coefficient between China's property prices and mortgage lending is relatively positive while an increase in the mortgage lending rate can effectively restrain the rise of property prices based on the macro-level data. Using Shanghai's monthly data, Tu & Zhang (2005) found the main determinants of Shanghai house price are one-period lagged house price, the ratio of real estate investment to fixed asset investment, FDI, and the variability of vacancy rate. Kuang (2005), Yan (2006), Song & Gao (2007), Huang et al. (2007) use VAR model to discuss the relationship of China's house price and land price. However, these papers are all based on national-level macro data or the data of individual cities. The results may subject to some restrictions.[2]

So far, only Shen & Liu (2004), Liang & Gao (2007) and Peng et al. (2008) use China's regional panel data to research China's house price. Shen & Liu (2004) used 1995–2002 panel data from 14 cities in China and found that the past and current information of economic fundamentals could partially explain the level or percentage change rate of house prices. Liang & Gao (2007) and Peng et al. (2008) used China's provincial-level panel data individually to analyze the influencing factors on house price. Liang & Gao (2007) focused their analysis on the regional difference of the effect of monetary system on house price. Peng et al. (2008) found a two-way linkage between house price and GDP growth; bank credit expansion did not play an "accelerating" role in house price inflation; house price growth in coastal areas may have deviated from fundamentals. But none of these three papers studied the specific policy factors which may have a potential impact on China's house price. Considering the unique nature of China's real estate market and the government's powerful influence, we cannot ignore policy factors when studying China's house price. The influence of policy

[2] Firstly, using macro data obscures regional differences in economic development and housing price change, therefore it cannot depict the regional path difference. Secondly, most literature based on the macro data uses the VAR model. Although the VAR model can avoid the endogenous problem of variables, the "VAR approach has been criticized as being devoid of any economic content" (Enders, 1995). Because the VAR model is completely dependent on the data's own statistical relationship, any change in sample interval will cause the instability of the result. For example, regarding the literature about the relationship of China's housing price and land price that we mentioned before, we find their conclusions differ greatly, even exactly opposite. Thirdly, the VAR model can only include two to three variables, which limits its explanatory power for housing price. Lastly, the sample size of macro data for China's housing price is generally small. In order to increase the sample size, some literature uses quarterly data rather than yearly data. But China's quarterly housing price index, which is published by the National Bureau of Statistics of China, is a year-on-year index. Since a quarterly year-on-year index cannot change to a fixed base index directly, most literature compensates by adding restrictions during the index changing process. This affects the accuracy of the data.

factors on house price is more effective than other factors. For example, the mechanism by which house price reflecting economic fundamentals is affected by China's land supply policy to a large extent. Since 2002, China's central government's macro-control on the real estate market has led a significant change of house price through a series of policy measures. From the aspect of data, Liang & Gao (2007) and Peng et al. (2008) used China's provincial-level panel data rather than the panel data based on subway areas or cities. Provincial-level panel data has problems similar to the national macro data in that they both use the added or averaged data. In addition, China's provincial administrative regions include several provinces, autonomous regions and municipalities. The nature of municipality data is different from the nature of provincial and autonomous region data which contain some cities, but a municipality (such as Beijing or Shanghai) is actually just one huge city. Using provincial-level panel data may lead to the estimation bias. According to existing literature, this paper is the first one which uses the panel data from 35 of China's main cities to do empirical research about China's house prices.

The rest of this paper is organized as follows: Section 2 recalls the evolution of China's real estate policy and provides a description of the variables used in the statistic approach that is employed in this paper. Section 3 discusses the relationship between house price and economic fundamentals, and tests whether house price behavior has structural change after the macro-control of the real estate market. Section 4 estimates the influence of policy controllable variables (financial loans, land supply, housing supply and demand, etc) on house price. Section 5 compares the factors that affect house price between eastern and the mid-western areas in China. Section 6 draws the conclusion and proposes policy implication.

2 Real Estate Policy Evolution and Data Descriptive Statistic

China's constitution stipulates that China's city and town area land is state-owned; rural area land is collectively-owned; the land ownership cannot be transferred and circulated. Under the constitutional framework, the land demander can only purchase the land-use right for a certain number of years. So the institutional background of China's real estate market is different from western countries which have private land system.

Before 1980, China had implemented a complete welfare-housing distribution system. Under this system, government constructed welfare-housing and

distributed the house to residents according to the government's housing plan. The transfer of welfare-housing was illegal at that time. After several reforms, China gradually establishes a dual-track house system. That is, Chinese government allows commercial housing market developing in some cities, but also reserves the welfare-housing distribution system. China did not start to establish a comprehensive real estate market until the *Notice on the Deepening of Housing Reform and Fasten Housing Construction* was published in 1998, which announced that the welfare-housing distribution system was abolished nationwide and residents needed to purchase commercial houses in the real estate market to solve residence problems.

However, since China's real estate market only transited from the welfare-housing distribution system recently, and China's house owners still only have land-use rights rather than land ownership, there have been a lot of imperfections in China's real estate market ever since its establishment. For example, government does not give clear stipulation about how to deal with the property when the 70-year land use right expire,[3] which will affect the house value assessment and the inheritance of the property. Also, Chinese government implements new policies and intervenes in the real estate market frequently. Compared with countries that operate with private land ownership, China's real estate market policy environment is not stable.

At the initial stage of the establishment of China's real estate market, the Government did not set a norm for the mode of transferring the land-use rights of state-owned land. At that time, there were many ways to transfer the land-use rights: unpublicized negotiation, and public bidding, auction or listing. But most land-use rights were transferred through closed-door negotiations. For the huge area of allotted land, which was allotted to the land users through government administrative decree, before 2002, the government allowed these allotted land users to transfer their land-use rights in the land market if they paid the overdue land-use rights transfer payments to the government. Hence, a large number of allotted land users directly transferred their land-use rights to new land users spontaneously through closed-door negotiation before 2002. In order to strength market supervision, China's central government decided to carry on macro-control of the real estate market from 2002 to present.

Macro-control of the real estate market started from rectifying the land market. In May of 2002, China's central authorities publicized the *Provision for the*

[3] Before 2007, there is no any regulation about how to deal with the property with land use right expire. *Real Right Law of People's Republic of China*, which passed in March 2007, stipulates that "when the residential land use right expires, government automatic renew the land use right" (Article 149), but for the fee of renewal the land use right, Chinese government still does not give any regulation.

Transferring State-owned Land by Bids, Auction or Listing. This provision requested terminating the transfer of land through closed-door negotiations, and declared that all the land-use rights must be transferred through public bids, auction or listing. In addition, this provision also prohibits the allotted land owners from transferring their land-use rights. If the allotted land owners hope to give up their land-use rights, the land can only be repurchased by Chinese government at a relatively low price. In fact, Chinese government has totally monopolized the land supply in the land market since the macro-control of the real estate market. Other sources of land supply have been cut off.

Under the macro-control of the real estate market, there are some policies that concern the banking credit for the real estate industry. However, compared to the land policy, the banking credit environment for the real estate industry is relative loose. From 2003 to 2007, China has overheated its economy to some extent. For example, fixed asset investment has grown rapidly, the supply of iron and steel, energy and transport is in tight supply, and China has felt the pressure of inflation. In order to control the growth of the banking credit, the central bank has raised the interest rates and commercial bank deposit reserve ratio several times while at the same time contracting the money supply. For the real estate market, the central bank raised the equity capital ratio of the real estate development program in April 2004 and raised the down payment ratio of housing loans from 20% to 30% in June 2006. However, the resident saving propensity is very high in China. In the last two decades, China's residents' saving deposits have grown rapidly, which has exert tremendous pressure on commercial banks to increasing loans. With China's blooming real estate industry, the loans for real estate are generally regarded as high-quality loans by commercial banks, while the potential risk of loans for other industries is relatively high. In this situation, in order to gain profit, the commercial banks need to increase the credit for the real estate industry even if they conflict with the central bank's policies about controlling the money supply and credit in real estate. Statistics show that China's total real estate investment from banking credit has increased from 222.03 billion yuan to 701.56 billion yuan from 2003 to 2007.

In the empirical process used in this paper, three aspects of variables are used: house prices, the variables reflecting economic fundamentals, and the variables controlled by policy. The data source of this paper is the yearly data from 35 of China's main cities,[4] which has been compiled by the National Bureau of Statistics of China. Such data is published in *China Statistical Yearbook, China*

[4] 35 main cities include all the municipalities, sub-provincial cities and provincial capital cities except for Lhasa.

City Statistical Yearbook, China Urban Life & Price Yearbook, and *China Real Estate Statistics Yearbook* respectively. The house price data whose unit is yuan per square meter is obtained from *China Real Estate Statistics Yearbook*.[5] Since we use the real average house price rather than the house price index as a metric unit, different cities' house prices are comparable horizontally. This choice avoids the spurious regression caused by using a no-comparable price index in the panel.[6] The housing vacancy area is also obtained from *China Real Estate Statistics Yearbook*. As the per capita actual utilization foreign capital is dollar-denominated, we use the year-end official exchange rate to change it into RMB-denominated. For all the RMB-denominated data, we eliminated the inflation factor by using CPI of individual cities, and obtained the real house price (in 1997 constant price). Real interest rate is obtained by a one-year bank lending interest rate minus CPI.

For the house price, we find that there are some differences among different cities in the sample range. The house price in eastern cities is generally higher than in the mid-western cities during the same period. Before 2002, when China's central government started macro-control on the real estate market, house price in most cities were stable; after 2002, house price started to rise sharply in most cities. The growth rate of house price was higher in eastern cities than in mid-western cities due to the beginning of macro-control of the real estate market. Fig. 1 and Fig. 2 reflect the trend of differences of house price in eastern and mid-western cities.

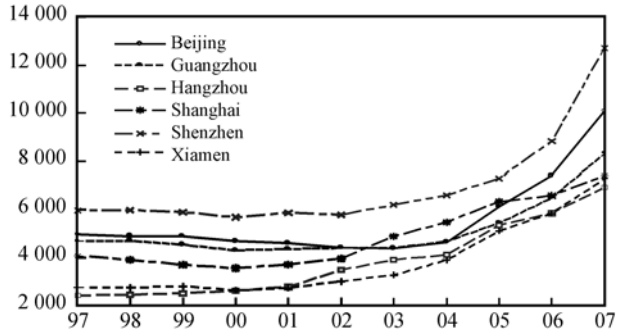

Fig. 1 Housing Price Change in Some East Cities

[5] *China Real Estate Statistics Yearbook* only publishes China 35 cities housing price with metric unit yuan/square meter after 2001. We use 2001 housing price as base, retrospectively deduce the housing price before 2001 through housing price index.

[6] In the past, most papers which use macro data to research china's housing price directly choose housing price index as the metric unit.

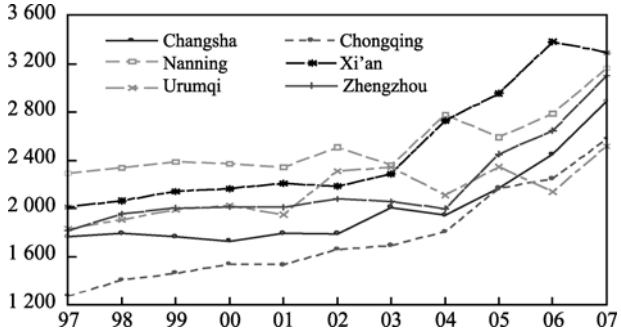

Fig. 2 Housing Price Change in Some Mid-western Cities

As we study the statistical character of economic fundamentals, with the exception of the real interest rate, we find that per capita disposable income, year-end non-agriculture population, the per capita actual utilization foreign capital, and per capita gross living space of residential buildings all maintain a trend of steady growth and there is not an obvious growth trend mutation.[7] The figures of economic fundamental variables may reflect a deviation in house price from economic fundamentals to some extent. Comparing Shanghai with Beijing, and Chongqing with Xi'an, we can also find that house price in the cities with relative higher economic fundamentals is not absolutely higher than in the cities with relative lower economic fundamentals.

Then we analyze the variables which are controlled by policies, especially those variables that changed because of China's macro-control on the real estate market.[8] Fig. 3 reflects the change of land purchased area in some cities since 2001. Since the government has totally controlled the land supply ever since the beginning of macro-control on the real estate market, the purchased land area can be regarded as land supply area. From the figure, we can see that the land supply area has decreased in most cities (except for Chongqing), which reflects the policy direction of reducing land supply ever since the beginning on macro-control of the real estate market. Because of the decreasing of land supply, there is only a small increase on housing sold area in most cities. The housing sold area has even decreased in some cities since 2004 (for example, in Beijing and Shenzhen). Fig. 4 displays the change of land supply. From the aspect of funding, we find that the real estate investment in most cities has not been affected by macro-control on real estate. Fig. 5 displays that real estate

[7] Because of limited space, figures are not given out.

[8] Many related real estate data in China's 35 cities has not been published by National Statistic Bureau of China before 2001 (these variables may not been included in the work of National Statistic Bureau of China). But it does not affect our later analysis.

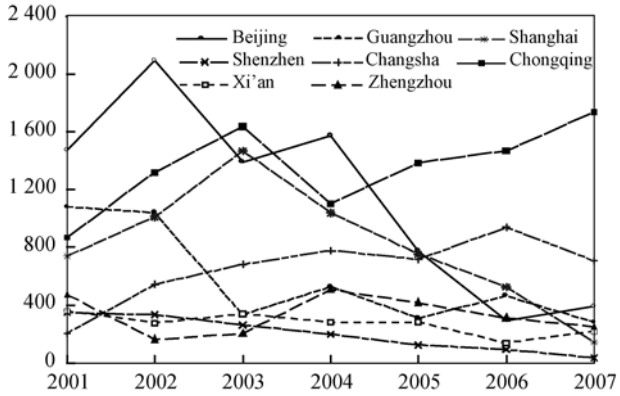

Fig. 3 Land Supply Change in Some Cities

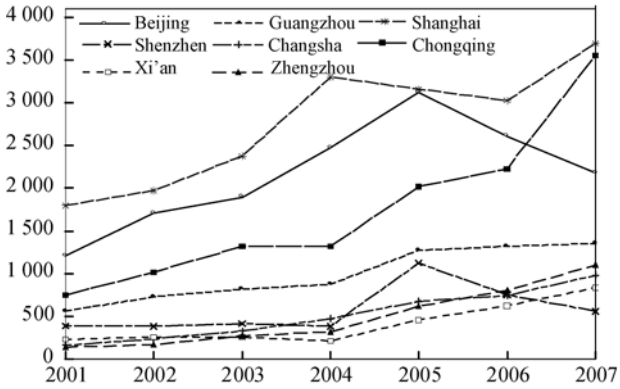

Fig. 4 Housing Sold Area Change in Some Cities

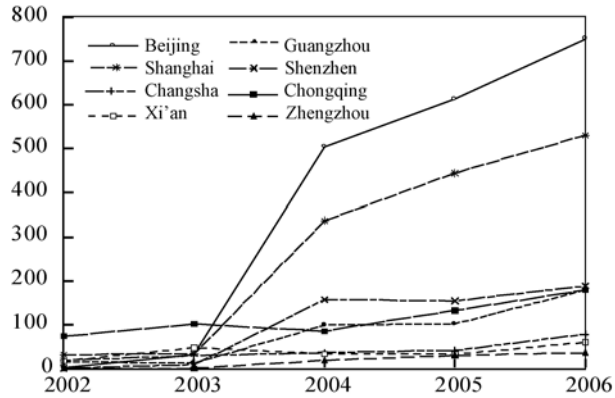

Fig. 5 Real Estate Investment from Credit Change in Some Cities

investment from credit has increased since the beginning of macro-control of real estate. Fig. 6 also displays that, the total investment of real estate has maintained an increasing trend during the sample interval, except for Beijing and Shanghai experienced a slight decrease in 2006.

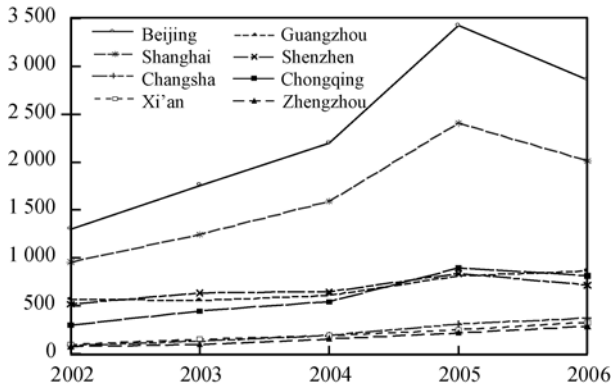

Fig. 6 Total Investment of Real Estate Change in Some Cities

3 The Relationship of China's House Price and Economic Fundamentals

When studying the relationship between China's house price and economic fundamentals, we adopt a widely used standard house price equation (Muellbauer & Murphy, 1997; Liang & Gao, 2007; Stevenson, 2008). The framework of this equation can be described as follows. The demand for housing, which is assumed to be proportional to the housing stock, can be specified as:

$$H / POP = f(y, \mu, D) \tag{1}$$

where H is the housing demand, and housing stock can be proxy of housing demand (Muellbauer & Murphy, 1997; Stevenson, 2008). POP is a demographic indicator used for measuring population, μ is the housing user cost, and D represents other factors that are determined to impact demand. The housing user cost can be defined as:

$$\mu = P^h (r + \delta - P^{he} / P^h) \tag{2}$$

where P^h is real house price, p^{he} is the expected house price, r is the real interest rate, δ is the rate of maintenance costs including property taxation. A further definition of the rate of return can be defined as:

$$\nu = r + \delta - P^{he} / P^{h} \tag{3}$$

That is the rate of imputed rent minus the expected rate of appreciation of house prices. Hence, we can rewrite the housing user cost as:

$$\mu = P^{h}\nu \tag{4}$$

Substitute μ in Eq. (1) with Eq. (4), then we can acquire the house price equation through inverting the demand Eq. (1):

$$p^{h} = g(POP,\ y,\ r,\ \mu,\ H / P) \tag{5}$$

The Chinese government does not impose a property tax and the maintenance cost can be ignored, so we do not consider δ in the empirical process. In the models, to measure the expected house price directly is difficult. however, the changing trajectory of the equation variables was considered to potentially include the house price expectations (Stevenson, 2008). Hence, we also ignore the P^{he}/P^{h} in the following empirical process as Liang & Gao (2007) and Stevenson (2008) did. In our equation of house price and economic fundamentals, ν will be substituted by real interest rate r. In addition, for China's special situation, city population and FDI are two potential other factors which may shift the demand curve. According to Krugman's (1991) special agglomeration framework, many scholars find that, in China, the greater the city population has, the more obvious the economic activity agglomeration effect is (Guo, 2006). This will lead various elements flowing to big cities. Hence, the city population becomes a factor that shifts the demand curve. FDI is an important driving factor in China's economic growth, and it is also an important economic fundamental variable which determines the housing demand. On one hand, the economic growth brought by FDI can increase housing demand; on the other, part of FDI can directly become the funding source of real estate development and housing purchases. So we add the population and per capita actual utilization foreign capital to our empirical model as the other housing demand factor. The panel model about house price and economic fundamentals can be described as following:

$$\begin{aligned} \ln(hprice_{it}) = {} & \beta_1 + \beta_2 \ln(nfpop_{it}) + \beta_3 \ln(income_{it}) + \beta_4 \ln(rr_{it}) \\ & + \beta_5 \ln(actfdi_{it}) + \beta_6 \ln(hperarea_{it}) + u_i + \lambda_t + \nu_{it} \end{aligned} \tag{6}$$

where $hprice_{it}$ is the house selling price; $nfpop_{it}$ is non-agriculture population; $income_{it}$ is per capita disposable income; rr_{it} is real interest rate; $actfdi_{it}$ is per capita actual utilization foreign capital, as the measure of FDI; $hperarea_{it}$ is per capita gross living space of residential buildings, as the measure of per capita housing stock. Subscript i and t denote city and year separately. μ_i denotes the unobservable individual-specific effect, λ_t denotes the unobservable time effect, and v_{it} is the remainder stochastic disturbance term. The sample interval is

1998–2006.

A critical assumption in the Error Component Panel Data Regression model is that the remainder stochastic disturbance term is not correlated with independent variables. If remainder stochastic disturbance term and independent variables are correlated, the random effects estimator becomes biased and inconsistent, but the fixed effect estimator is still unbiased and consistent. Hausman (1978) suggests a test compares the different probability limits of random effects estimator with fixed effects estimator as the selection criteria for random effect estimator and fixed effect estimator. Here, the Hausman test χ^2-statistic is 40.47, which is significant under the 5% level. It indicates that the random effect estimator is inconsistent, so we choose fix effect estimator for Eq. (6). Table 1 is the regression result of Eq. (6).

Table 1 The Fixed Effects Panel Estimator of House Price and Economic Fundamentals

Independent variables	1998–2001		2002–2006		1998–2006	
	Including individual effect only	Including individual and time effect	Including individual effect only	Including individual and time effect	Including individual effect only	Including individual and time effect
_cons	5.967***	–1.874	–0.179	–0.730	–0.384	–5.744*
	(0.491)	(1.379)	(0.578)	(5.933)	(0.411)	(3.244)
ln(*nfpop*)	0.033	0.035	0.208*	0.168	0.337***	0.303***
	(0.078)	(0.077)	(0.115)	(0.130)	(0.067)	(0.078)
ln(*income*)	0.184***	0.126*	0.600***	0.511**	0.618***	0.520***
	(0.054)	(0.076)	(0.121)	(0.200)	(0.062)	(0.110)
ln(*rr*)	0.003	4.915***	0.960***	2.095	0.441***	4.448**
	(0.034)	(0.760)	(0.328)	(3.659)	(0.065)	(1.884)
ln(*actfdi*)	0.005	0.009	–0.038**	–0.039**	–0.005	–0.001
	(0.007)	(0.006)	(0.018)	(0.018)	(0.013)	(0.013)
ln(*hperarea*)	–0.064**	–0.034	0.230*	0.198	0.075	0.098
	(0.030)	(0.026)	(0.130)	(0.144)	(0.063)	(0.069)
Adj-R^2	0.993	0.995	0.940	0.940	0.924	0.929
F-statistic	523.557***	684.908***	70.923***	63.838***	99.129***	87.856***
Sample size	140	140	175	175	315	315

Note: ***, ** and * indicate rejection of the null hypothesis at 1%, 5% and 10%, respectively.

According to the results of Table 1, although some regression coefficients which reflect the economic fundamentals are significant, we cannot conclude that the house price reflects the economic fundamentals. As China's central government launched macro-control on real estate market in 2002, we divide the sample interval into two sub-intervals of 1998–2001 and 2002–2006, then we find the regression coefficients are different. For the total sample of 1998–2006, the estimate result indicates that non-agriculture population, per capita disposable income and real interest rate can positively affect the house price significantly.

However, comparing the regression coefficients of the two sub-intervals with the total interval, we can find that some significant coefficients in total interval are not significant in the two sub-intervals, and some insignificant coefficients in total interval become significant in the two sub-intervals. From the fixed effects panel estimator including individual and time effects, we find in front of the macro-control of the real estate market (1998–2001), only real interest rate is significant at the 5% level; after the macro-control on the real estate market (2002–2006), real interest rate is no longer significant, but per capita disposable income and per capita actual utilization foreign capital become significant at the 5% level. Furthermore, the signs of the regression coefficients are so different between the two sub-intervals, for example, the per capita actual utilization foreign capital and per capita gross living space of residential buildings. So there may be a structural change before and after the macro-control on the real estate market for the equation of house price and economic fundamentals.

Next, we conduct the Chow test for parameter stability to test whether Eq. (6) has structural change before and after the macro-control of the real estate market. As we use panel data, we extend the traditional Chow test to adapt to the form of panel data (here, we use the fixed effect estimation and ignore the time effect). We impose the data of 1998–2001 as sample 1, and the data of 2002–2006 as sample 2, where *RSS* is the residual sum of squares of the total sample, RSS_1 and RSS_2 are the residual sum of squares of sample 1 and sample 2 respectively. If there has no any structural change, we have the following *F*-statistic:

$$F = \frac{(RSS - RSS_1 - RSS_2)/(N+K)}{(RSS_1 + RSS_2)/[NT - 2(N+K)]} \sim F(N+K, NT - 2(N+K)) \qquad (7)$$

where K is the number of independent variables, here K=5. By means of calculation, F=8.317 $>$ $F_{0.05}$(40, 235)=1.446, therefore we refuse the null hypothesis of no structural change. It indicates that the relationship of house price and economic fundamentals indeed has different manifestations before and after the macro-control of real estate market.

In order to study the dynamic impact of macro-control on real estate to house price over time, we construct new dummy variables. The setting principle of the new dummy variables is:

$$\begin{cases} yearN=1, \text{ the } N \text{ year after the macro-control on the real estate market} \\ yearN=0, \text{ otherwise} \end{cases}$$

Firstly, we use house price to regress on the *year* dummy variables to estimate the total effect of the macro-control on the real estate market to house price, then we use the *year* dummy variables to substitute the time effect λ_t to estimate the

partial effect of the macro-control on the real estate market.[9] Fig. 7 depicts the total effect and partial effect, Fig. 8 gives the corresponding *t*-statistic of total effect and partial effect with 5% and 10% level critical value.

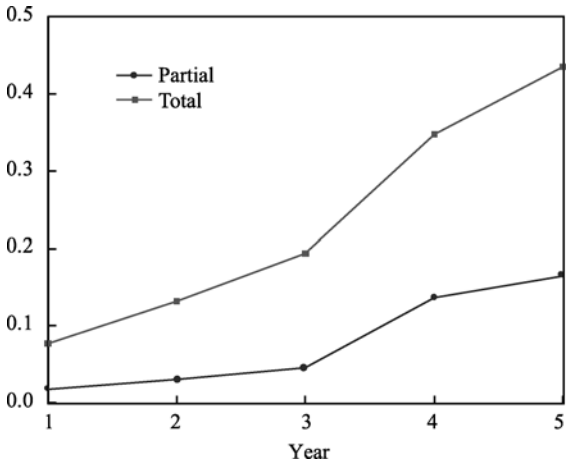

Fig. 7 The Dynamic Effect of Macro-control of Real Estate Market

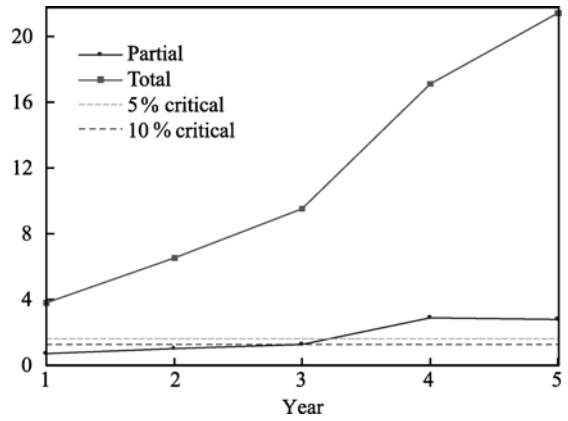

Fig. 8 The Corresponding *t*-statistic of the Dynamic Effect of Macro-Control on Real Estate Market

[9] In fact, the time effect λ_t is not been estimated when we use least squares dummy variables (LSDV) method, it is eliminated by the algebraic process. That is, in the panel data with time fixed effect only, average the $y_{it} = \alpha + \beta x_{it} + \lambda_t + \nu_{it}$ by the individual to obtain $\overline{y}_{.t} = \alpha + \beta \overline{x}_{.t} + \lambda_t + \overline{v}_{.t}$, then subtracts the two equation to obtain $y_{it} - \overline{y}_{.t} = \beta(x_{it} - \overline{x}_{.t}) + (\nu_{it} - \overline{v}_{.t})$ which is the final OLS regression equation. For the panel data model with individual and time fixed effect, the LSDV method is similar with the above, detail can be seen on Baltagi (2005).

From Fig. 7, we can see the macro-control on the real estate market has a positive effect on the house price, which illustrates that the house price deviates from the economic fundamentals to some extent. The configuration of total effect and partial effect is similar, but the line of total effect is higher than the partial effect, which implies that the macro-control of the real estate market can indirectly influence house price through its effect on other variables (including economic fundamentals and the variables of the real estate market itself). From Fig. 8, we find the partial effect becomes significant from the third year of the macro-control of the real estate market. It indicates that there exists some time-lag for the direct policy effect. The total effect is significant immediately, which also implies the indirect influence of macro-control on the real estate market to economic fundamentals and the variables of the real estate market itself. This indirect influence may also lead the house price deviate from economic fundamentals, and make the economic fundamentals have less explanatory power for house price.

For further analysis, we consider that China's economic fundamentals lacks explanatory power for house price, which can be attributed to the environment created by China's real estate market policies. Actually, the essence of the standard equation of house price and economic fundamentals is an inverted housing demand equation. The precondition of house price reflecting economic fundamentals is the scenario of private land ownership. Under the institution of private land ownership, land as well as housing supply can be endogenously determined by housing demand. When there is some change of economic fundamentals, the housing demand will change, and this will lead to a change in house price. Then, the change of the house price will cause the land owners to change their land supply, which will result in the change of new housing supply. Under this mechanism, house price may form a long-term equilibrium with economic fundamentals. However, China is not a country with private land ownership system. The land for real estate development is completely state-owned, and the land-use rights can be transferred for only a certain period. This determines that China's land market cannot spontaneously modulate the land supply according to the change of land demand. Before the beginning of macro-control on the real estate market, the government allowed the allotted land users to directly transfer their land-use rights in the land market, which is equivalent to considerable numbers of land suppliers in the land market and a certain degree of market modulation mechanisms. But since the macro-control of the real estate market, the direct transfer of allotted land-use rights has been completely forbidden by the government. The Chinese government has totally monopolized the land supply and eliminated the natural elasticity of land supply. In Section 2, we have seen that, despite the rapid growth of the house price, the land supply is undergoing negative growth in most cities, and housing supply has

shown little increase. Thus, it is difficult for China to develop a stable relationship between house prices and economic fundamentals. Furthermore, compared with the countries with private land ownership, in China the government intervenes in the real estate market with high frequency and great force. This gives us the necessity to study the influence on the real estate policy controlling variables on the house price.

4 The Influencing Factors on House Prices after the Macro-control on the Real Estate Market

According to the research above, we have found that China's house price cannot be explained well by the economic fundamentals, and the deviation trends of house price from economic fundamentals has become more serious since the macro-control on the real estate market. In order to analyze whether house price is affected by real estate policy since the macro-control on the real estate market, we do empirical research in this part. Based on the analysis of the evolution of real estate policy, we consider that the land supply, banking credit of real estate and the supply and demand structure of the housing market are the main factors affected by government policies.

First of all, since ownership of China's land cannot be transferred and circulated, China's real estate market is established on the base of land-use rights being transferred by the government for a certain period of time, which makes China's land supply constantly affected by government policy. Furthermore, the government even monopolized land supply since the beginning of macro-control on the real estate market. Thus, land supply has completely become a government controllable variable.

Second, the banking credit of real estate is also a variable affected by government policy. Due to the macro control on real estate, the government has made some specific policies for banking credit. But the banking credit environment is still relatively loose overall. There is no rigorous regulation such as compulsively reducing the banking credit for real estates.

Finally, government policies greatly influence the structure of supply and demand in the housing market. We consider that, after the macro-control on the real estate market, the structure change of demand and supply in the housing market will result in the deviation of the house price from the economic fundamentals to some extent. However, the structure of supply and demand in the housing market is complicated. Not only different types of house have different construction periods, selling periods and selling methods, but also there are different reasons for housing vacancy areas existing in the market. Furthermore, it is hard to use data to distinguish housing supply from housing demand. In general, housing sold area can be regarded as the equilibrium of

housing supply and demand. However, since the macro-control on the real estate market, the Chinese government's restrictions and strict land supply policy, the housing sold area mainly reflects the housing supply rather than the equilibrium of housing supply and demand. Hence, housing sold area is also a government policy controllable variable. In China, most house is sold as forward delivery house, and the forward delivery house is also sold in batches. The construction period, selling period and selling batches are totally different in different real estate projects. Thus, the completed building areas are not the direct measure of the housing supply either. There are different reasons for forming the housing vacancy area in the housing market. Some housing vacant areas are friction housing vacancy area, which is formed because house selling has a certain delay period; some vacancy area is formed because of the fault of house design or construction; some housing vacant areas are formed because of poor selling, that is, housing supply exceed demand. However, in China, some real estate enterprises will choose some non-normal marketing methods to deliberately create housing vacancy. Many investigations find that, since the macro-control on the real estate market, large areas of housing vacant areas have been formed because of the "cover plate" actions of real estate enterprises; that is, a large number of real estate enterprises choose to postpone selling some house and to create an atmosphere where supply falls short of demand in order to make higher profit. Although China's housing vacancy area is an important factor reflecting the market structure of housing supply and demand, it is an integrative result of man-made factors and housing supply and demand. In the following empirical process, our model will include these three variables: housing sold area, building completed area and housing vacancy area. There may be collinearity between housing sold area and building completed area, so the strategy of this paper is to include all three variables in the model, then eliminate the non-significant variable due to collinearity.

We choose the dynamic panel data model to estimate the specific influential factors of house price after the macro-control on the real estate market. In this model, there is a lagged dependent variable as an independent variable, which controls the accumulation effect. The model can be expressed in the following form:

$$\ln(hprice_{it}) = \beta_1 + \beta_2 \ln(hprice_{it-1}) + X'_{it}\gamma_1 + Z'_{it}\gamma_2 + u_i + \lambda_t + \nu_{it} \tag{8}$$

where X_{it} is a control vector of economic fundamental variables, including the natural logarithm of non-agriculture population $nfpop_{it}$, per capita disposable income $income_{it}$, real interest rate rr_{it}, per capita actual utilization foreign capital $actfdi_{it}$, and per capita gross living space of residential buildings $hperarea_{it}$. Z_{it} is a control vector of non-economic fundamentals variables, including land purchased area $lbuyarea_{it}$ (reflect the land supply), real estate investment from

credit $bankloan_{it}$, total investment of real estate $fund_{it}$, and lag of buildings completed area $hbldedarea_{it-1}$, housing sold area $hsalearea_{it}$, housing vacancy area $hvacum_{it}$. We choose the Arellano and Bond (1991) GMM method to estimate the model. The AB-GMM method can eliminate endogeneity through the instrumental variables of second lag of dependent variable and difference of exogenous independent variables. We can diagnose the consistency of the AB-GMM estimator through testing the whether there is serial correlation of second lag of regression residuals. In addition, we can use the Sargan test, which is based on testing the over-indentifying restrictions, to test the validity of the instrumental variables. The null hypothesis of the Sargan test is that the instrument variables are valid. The regression result can be seen in Table 2.

From the regression result of different model forms, we can see the signs are completely uniform, and significant levels are roughly the same. All the Wald χ^2 statistics are significant to a 99% level of confidence, which rejects the null hypothesis that all the regression coefficients are zero. All the Sargan χ^2 statistics are not significant, which shows that the over-indentifying restriction is valid. The results of the Arellano-Bond AR(2) tests show that there is no serial correlation of second lag of regression residuals. Thus, the model setting is correct. The regression result indicates the following inferences.

(1) Except for non-agriculture population, the economic fundamental variables are not significant, which is consistent with the results of Section 3. These results show that the explanatory power of economic fundamentals is too weak to explain the house price change, which is even more obvious since the macro-control of the real estate market. This result also implies that we should search for the explanatory factors of house price change within the different aspects of China's real estate policy. We find that the coefficient of non-agriculture population is negative and significant, which seems contrary to the traditional theory. But some papers also encounter the negative coefficient of population when studying the house price (Hort, 1998; Gallin, 2006). Gallin (2006) implied it as an exhibition of house price not reflecting economic fundamentals. In addition, we should note that China's non-agriculture population data is compiled according to the registered permanent residence system (Hukou). But in China's main cities, there is large number of residents who are not in the registered permanent residence system, which may lead to inaccurate demography.

(2) The land supply has a significant negative effect on house price. In the sample interval, all the regression coefficients of land purchased area are negative and significant, which means the decrease of land supply can lead to an increase in house price. With China's rapid urbanization process, the land becomes scarcer. Since the macro-control on the real estate market, the Government has completely monopolized and decreased the land supply, which aggravates the expectation of the decrease of land supply in the future. Under this situation, some real estate enterprises start to speculatively hoard land. But

China's central authority has not taken effective measures to punish the speculative hoarding of land by real estate enterprises. With more and more land being speculatively hoarded, the decrease of land and housing supply aggravates the market, which leads house prices to rise.

Table 2 Regression Result of Influent Factors of House Price

Independent variables	(1)	(2)	(3)	(4)	(5)	(5)
_cons	8.461** (3.821)	7.003* (3.961)	3.768*** (0.700)	3.366*** (0.556)	1.644 (3.018)	3.875*** (0.624)
L.ln(*hprice*)	0.644*** (0.088)	0.711*** (0.085)	0.705*** (0.072)	0.648*** (0.070)	0.617*** (0.073)	0.615*** (0.073)
ln(*nfpop*)	–0.154** (0.070)	–0.150** (0.069)	–0.148** (0.075)	–0.171** (0.071)		
ln(*income*)	–0.201 (0.178))	–0.193 (0.180)				
ln(*rr*)	–1.174 (3.108)	–0.665 (3.161)			1.411 (1.821)	
ln(*actfdi*)	–0.012 (0.013)	–0.010 (0.012)				
ln(*hperarea*)	–0.030 (0.069)	–0.036 (0.065)				
L.ln(*hbldedarea*)	0.012 (0.015)					
ln(*hsalearea*)	–0.075*** (0.025)	–0.059** (0.023)	–0.035** (0.018)	–0.084*** (0.020)	–0.084*** (0.021)	–0.089*** (0.021)
ln(*hvacum*)	–0.079*** (0.013)	–0.078*** (0.013)	–0.072*** (0.010)	–0.062*** (0.010)	–0.003*** (0.000)	–0.003*** (0.000)
ln(*lbuyarea*)	–0.023** (0.009)	–0.020** (0.008)	–0.019** (0.009)	–0.019* (0.013)	–0.023** (0.011)	–0.024** (0.010)
ln(*bankloan*)	0.006* (0.003)	0.008** (0.004)	0.009*** (0.002)			
ln(*fund*)				0.091*** (0.021)		
Individual effect	Control	Control	Control	Control	Control	Control
Time effect	Control	Control	Control	Control	Control	Control
Wald χ^2statistic	15 846.1***	13 263.2***	55 876.7***	21 568.4***	10 996.5***	9 877.8***
Sargan χ^2 statistic	25.586	25.136	26.777	27.707	24.374	24.828
AR(2) *Z* statistic	0.806	0.802	0.704	0.634	1.049	1.048
Sample	140	140	140	140	175	175

Note: ***, ** and * indicate rejection of the null hypothesis at 1%, 5% and 10%, respectively. The number in parenthesis is standard error, L is lag operator. The sample interval of Eq. (1)–(4) is 2002–2006, the sample interval of Eq. (5)–(6) is 2002–2007.

(3) Financial credit, especially the bank loan for real estate, has a positive and significant effect on house prices. In Table 2, setting (1)–(3) and (4) use bank loans for real estate and total investment of real estate as independent variables respectively, we find the regression coefficients are both positive and significant, the latter is bigger than the former one. [10] This indicates that, in China's real estate market, the mechanism of financial credit promotes the house price which is supported by Kiyotaki & Moore (1997) and Bernanke et al. (1998) does exist. This result also supports the finding that the relationship between China's property prices and bank lending given by Liang & Cao (2007) who use China's time serial data. However, we find that the real interest rate has an insignificant effect on house prices, which means that adjusting the interest rate may only have a limited effect on house prices.

(4) Housing sold areas and housing vacancy areas have a negative and significant effect on house price. In the setting (1) of Table 2, we include housing sold area, housing vacancy area, and lagged buildings completed area in our mode. But we find the coefficient of lagged building completed area is not significant. This may due to the multicollinearity of these three variables, so we only reserve housing sold area and housing vacancy area on the setting of (2)–(6) (the coefficient sign and significance keep the same). In the regression result, the coefficient of housing sold area is positive and significant, which means that there is a significant negative relationship between housing sold area and house price. The housing supply increase is significantly restricted by land policy, which pushes up the house price to some extent. It also implies the effectiveness of increasing housing supply so as to stabilize the house price. Shen & Liu (2004) based on China's data prior to 2002 and Seko (2003) based on Japan's data find that housing vacancy area has a positive relationship with house price (the coefficient of housing vacancy area is not significant in Seko's paper).[11] But we find that housing vacancy has a negative and significant relationship with house price, which is in accord with common opinion. For the housing vacancy area formed by poor selling, the bigger the housing vacancy area, the more serious oversupply, and the house price may drop. But as we showed in our analysis

[10] The bank loan for real estate only includes the funding directly coming from the bank loan. The total investment of real estate includes high percentage of funding indirect coming from the bank loan. Thus the total investment actually inflects the bank leading credit for real estate.

[11] We do not exclude the possibility of improper use of econometric method in these two papers. Shen & Liu (2004) include multi-period lags of each independent variable in the model, which may lead serious multicollinerity problems. They also do not treat the endogenous problem when including lagged dependent variable as independent variable.

before, much housing vacancy area is formed due to the prevalent "covering plate" of real estate enterprises in 2002–2007. Although speculative hoarding can accelerate the rise of house price in the short-term, with the increase of the housing vacancy area, the real estate enterprise has tremendous liquidity pressure. Thus, the increasing of housing vacancy area through the "covering plate" can lead to the decrease of house price in the long-term. Our regression result supports the analysis, the rise of housing vacancy area leads the house price decline. In addition, we find that the absolute value of the regression coefficient of housing sold area and vacancy area is bigger than land supply and financial credit factors. It reflects that the direct influence of housing supply and demand is stronger than the indirect influence of land and financial credit.

(5) There are obvious accumulation effects for house price. All the regression results show that the sign of coefficient of lag dependent variable is positive and significant, which implies that the house price change can be accumulative. When the house prices grow rapidly, the expectation of house price continually rising will prevail in the real estate market, and the speculation will increase correspondingly. Then the house price may increase in next period. When the house price is stable or decreasing, the situation is the contrary.

5 Comparing of Eastern and Mid-western Cities

In China, the regional development difference is remarkable. For the aspect of economic aggregate, openness to the outside world, quality of the population, infrastructure, and living standard, eastern cities are higher than mid-western cities. Thus, the house price behavior may also be different between the eastern and mid-western cities.

Table 3 gives the comparing regression results of eastern and mid-western cities on Eq. (8). We find that the regression results of the eastern cities are broadly consistent with the regression results of the total 35 cities. Although the signs and values of the regression coefficients based on mid-western cities are similar to those based on the total 35 cities, some coefficients are no longer significant.

The drop of significance may result from the small sample size. As we divide the total sample into two sub-samples, each sample size is greatly reduced, especially for the sub-sample of mid-western cities. In our model, the number of the independent variables is relative large, which also reduces the degree of freedom. In addition, the AB-GMM estimation uses instrumental variables. Hence, it may lead to the low significance of regression result of mid-western cities.

Table 3 The Regional Comparing of the Influence Factor of House Price since the Macro-control on Real Estate Market

Independent variables	East cities			Mid-west cities		
	(1)	(2)	(3)	(4)	(5)	(6)
_Cons	4.621***	5.868***	6.602***	6.541***	7.421***	11.015***
	(1.051)	(1.259)	(1.491)	(1.815)	(2.387)	(2.835)
L.ln(*hprice*)	0.576***	0.365**	0.165	0.225	0.068	0.641*
	(0.117)	(0.148)	(0.180)	(0.219)	(0.315)	(0.390)
ln(*nfpop*)	–0.066			–0.016		
	(0.057)			(0.138)		
Ln(*hsalearea*)	–0.039	–0.044	0.114***	–0.061*	–0.029	–0.013
	(0.039)	(0.033)	(0.039)	(0.034)	(0.036)	(0.044)
ln(*hvacum*)	–0.056**	–0.048**	–0.047**	–0.035	–0.027	0.001
	(0.028)	(0.025)	(0.019)	(0.029)	(0.030)	(0.026)
ln(*lbuyarea*)	–0.049***	–0.030**	–0.055***	–0.000	–0.000	–0.002
	(0.014)	(0.016)	(0.015)	(0.019)	(0.019)	(0.018)
ln(*bankloan*)	0.004*	0.003		0.003	0.004	
	(0.002)	(0.002)		(0.008)	(0.008)	
ln(*fund*)			0.100**			0.120
			(0.048)			(0.048)
Individual effect	Control	Control	Control	Control	Control	Control
Time effect	Control	Control	Control	Control	Control	Control
Wald χ^2 statistic	7 311.1***	5 868.9***	7 101.9***	1 171.9***	2 550.8***	469.7***
Sargan χ^2 statistic	10.843	9.195	4.818	6.503	10.704	3.124
AR(2) *Z* statistic	–1.314	–1.194	–2.211**	1.150	1.244	0.146
Sample	72	72	72	68	68	68

Note: ***, ** and * indicate rejection of the null hypothesis at 1%, 5% and 10%, respectively. We use small sample statistics. The number in parenthesis is standard error, L is lag operator. The sample interval is 2002–2006.

On the other side, the difference in the results also reflects the difference of real estate prosperity and the scarcity of land between eastern and mid-western cities. For all the settings of mid-western cities, we find that the variables of housing vacant area, land purchased area, and the financial credit (real estate investment from bank credit and the total investment of real estate) are not significant. We consider one of the main reasons to be that the real estate industry is not prosperous in mid-western cities, and, relatively speaking, mid-west cities do not lack of land. In the process of purchasing land for real estate development, the dependence of financial credit is relatively light for real

estate enterprises in the mid-west. Because of the low housing purchasing power in mid-western cities, the phenomenon of speculative hoarding is less prevalent in mid-western cities than in eastern cities, which leads to the fact that the housing vacant area in mid-western cities has less effect on house price than in eastern cities. From the results, we can see the land supply factor has an insignificant regression coefficient. This not only reflects the more plentiful land resources in mid-western cities, but it also reflects the relatively *laissez-faire* land supply policy in mid-western cities. We can see in Fig. 4 that the land supply in a small number of mid-western cities (Chongqing and Changsha) has increased since macro-control of the real estate market.

6 Conclusion and Policy Suggestion

Although China experienced a sharp house price increase in the past few years, as many other countries in the world did, the cause of China's house price increase is not exactly the same. China's house price is affected by government real estate policy to a large extent. Firstly, this paper gives a retrospective description of China's real estate policy change. Then, we research the relationship between China's house price and economic fundamentals. China's land institution is so different from other countries that operate with private land ownership. On top of this, the Chinese government has adopted strict land supply policies since the beginning of macro-control on the real estate market. The result is that China has lost the mechanism of self modulating land supply in the land market. In this situation, we conclude that China's house price lacks a stable relationship with economic fundamentals. There is an obvious structure change of the equation that connects house prices to economic fundamentals. We show that since the macro-control on the real estate market, China's house price has deviated upward from the economic fundamentals. Later, we study the relationship between house prices and the variables which are controlled by real estate policy. We find that, after macro-control on the real estate market, land supply has a negative and significant effect on house price, so do the housing sold area and housing vacant area which reflect the housing supply and demand. This indicates that China's strict land supply policy since the macro-control on the real estate market has raised the house price in the last few years to a large extent. At the same time, we find the banking credit has a positive and significant effect on house price, which indicates that China's relative loop finance credit policy also leads the increase in house price to a certain extent. Finally, we compare the factors that influence house prices of eastern cities and mid-western cities. We find the regression result of eastern cities is approximately the same as

total sample regression, but there are some differences between the regression result of mid-western cities and the total 35 cities.

While China's house price has deviated upward from the economic fundamentals, and China confronts the economic downward cycle, it is possible for the house price to go downward over the next few years. But China's industry chain of real estate is long and driving effects of real estate to the correlative industries is intensive (see the calculation result of Research Group of National Bureau of Statistics of China, 2005 and Wang & Liu, 2004). Sudden changes in house price will bring a tremendous impact on the entire national economy. In order to avoid an intense fluctuation of house price, the Chinese government is actually confronting the choice of whether to continue its administrative ways of controlling house price or adopting a more free market mechanism to adjust the house price. We consider that the Chinese government should choose flexible market-oriented policy for real estate development. At the same time, the Chinese government should enact strict laws and regulations for the real estate market and severely punish speculative actions in the market. At present, China's legal system for real estate is inadequate, and the government usually makes temporary provisions such as regulation, notice and government document. This causes China's real estate policy lacks of coherence. Hence, the Chinese government needs to enact an appropriate legal system for the real estate market, and make full use of the market mechanism rather than administrative order to modulate house price. Firstly, for the land supply, government should make a stipulation for the appropriate land-use rights transfers under China's legal framework. Let the land-use rights, especially the land-use rights of land allotted before the housing system reform, be transferred directly in the land market. In this way, the land market can form the mechanism of self modulating the land supply according to the fluctuation of house price, which has the effect of maintaining a stable house price. At the same time, the government should strictly punish real estate enterprises found to be guilty of speculative land hoarding to ensure the normal operation of the land market. Secondly, since banking credit for real estate has a significant positive effect on house price, China's government should make banking credit policy more flexible to help modulate house prices. Thirdly, government should strictly restrict the "cover plate" action of real estate enterprises. Fourthly, because of the regional differences in house prices, the government should tailor specifically targeted house price policies for different regions.

Due to the limitation of the data, we do not include foreign factors, such as international hot money and tax policy in this paper. This is our future research direction.

Acknowledgements I appreciate Professor Geoffrey J. D. Hewing for his helpful guidance when I wrote this paper at University of Illinois as a visiting scholar. I also would like to thank anonymous referee for the helpful comments.

References

Arellano M, Bond S (1991). Some tests for specification for panel data: Monte Carlo evidence and an application for employment equation. Review of Economic Studies, 58: 277–297

Baltagi B H (2005). Econometric Analysis of Panel Data (3rd edition). Chichester: John Wiley & Sons, 33–35

Bernanke B S, Gertler M, Gilchrist S (1999). The financial accelerator in a quantitative business cycle framework. In: Handbook of Macroeconomics, edited by Taylor J B & Woodford M. Amsterdam: Elsevier Science. 1: 1341–1393

Capozza D R, Hendershott P H, Mack C, Mayer C J (2002). Determinants of real house price dynamics. NBER Working Paper, No. W9262

Collyns C, Senhadji A (2002). Lending booms, real estate bubbles and the Asian Crisis. IMF Working Paper No. 02/20

Enders W (1995). Applied Econometric Time Series. Chichester: John Wiley & Sons, 321

Gallin J (2006). The long-run relationship between house prices and income: Evidence from local housing markets. Real Estate Economics, 34 (3): 417–438

Gerlach S, Peng W (2005). Bank lending and property prices in Hong Kong. Journal of Banking & Finance, 29: 461–481

Glindro E T, Subhanij T, Szeto J, Zhu H (2008). Determinants of house prices in nine Asia-Pacific economies. Bank for International Settlements (BIS) Working Papers, No. 263

Goodhart C (1995). Price stability and financial fragility. In: Financial Stability in a Changing Environment, edited by Sawamoto K, Nakajima Z and Taguchi H. New. York: St. Martin's Press

Hort K (1998). The determinants of urban house price fluctuations in Sweden 1968–1994. Journal of Housing Economics, 7: 93–120

Kiyotaki N, Moore J (1997). Credit cycles. Journal of Political Economy, 105 (2): 211–248

Krugman P (1991). Increasing returns and economic geography. Journal of Political Economy, 99 (3): 483–499

Liang Q, Cao H (2007). Property prices and bank lending in China. Journal of Asian Economics, 18: 63–75

Mankiw G, Weil D (1989). The Baby boom, the baby bust, and the housing market. Regional Science and Urban Economics, 19 (2): 235–258

McQuinn K, O'Reilly G (2008). Assessing the role of income and interest rates in determining house prices. Economic Modelling, 25 (3): 377–390

Mikhed V, Zemčík P (2007). Do house prices reflect fundamentals? Aggregate and panel data evidence. Working Paper, Center for Economic Research and Graduate Education, Charles University and the Economics Institute of the Academy of Sciences of the Czech Republic

Muellbauer J, Murphy A (1997). Booms and busts in the UK housing market. Economic Journal, 107 (455): 1701–1727

Peng W,Tam D C, Yiu M S (2008). Property market and the macroeconomy of Mainland China: A cross region study. Pacific Economic Review, 13 (2): 240–258

Priemus H (2003). Land policy, house prices and housing quality: Empirical evidence from the

Netherlands. Housing, Theory and Society, 20 (3): 127–132
Seko M (2003). Housing prices and economic cycles. In: Housing Market and the Macro Economy, The Nexus Conference, Hong Kong, China. July 25–26
Stevenson S (2008). Modeling housing market fundamentals: Empirical evidence of extreme market conditions. Real Estate Economics, 36 (1): 1–29
付敏 (Fu Min) (2005). 我国房地产泡沫问题讨论综述 (Survey on the issue of China's housing price bubble). 经济理论与经济管理, (6): 76–80
郭文杰 (Guo Wenjie) (2006). 服务业增长、城市化与经济发展——改革开放后中国数据的经验研究 (Service sector growth, urbanization and economic development). 当代经济科学, (5): 92–97
国家统计局综合司课题组 (Research Group of National Bureau of Statistics of China) (2005). 关于房地产对国民经济影响的初步分析 (The analysis of the impact of real rast industry to China's economy). 管理世界, (11): 30–33
黄健柏，江飞涛，陈伟刚 (Huang Jianbai, Jiang Feitao, Chen Weigang) (2007). 对我国房价与地价相互关系的再检验 (Further test of the relationship between the housing price and the land price). 预测, (2): 1–7
况伟大 (Kuang Weida) (2005). 房价与地价关系研究:模型及中国数据检验 (A study on the relationship between housing price and land pricing: Basic model and evidence from China). 财贸经济, (11): 56–63
梁云芳，高铁梅 (Liang Yunfang, Gao Tiemei) (2007). 中国房地产价格波动区域差异的实证分析 (Empirical analysis on real estate price fluctuation in different provinces of China). 经济研究, (8): 133–142
沈悦，刘洪玉 (Shen Yue, Liu Hongyu) (2004). 住宅价格与经济基本面:1995–2002 年中国 14 城市的实证研究 (Housing prices and economic fundamentals: A cross city analysis of China for 1995–2002). 经济研究, (6): 78–86
宋勃，高波 (Song Bo, Gao Bo) (2007). 房价与地价关系的因果检验:1998–2006 (A causality test for housing and land prices: 1998–2006). 当代经济科学, (1): 72–78
屠佳华，张洁 (Tu Jiahua, Zhang Jie) (2005). 什么推动了房价的上涨:来自上海房地产市场的证据 (What pushes up the house price: Evidence from Shanghai). 世界经济, (5): 28–37
王国军，刘水杏 (Wang Guojun, Liu Shuixin) (2004). 房地产业对相关产业的带动效应研究 (The driving effects on real estate to the correlative industries). 经济研究, (8): 38–47
严金海 (Yan Jinhai) (2006). 中国的房价与地价:理论、实证和政策分析 (Land price and housing price in China: A theoretical & empirical study). 数量经济技术经济研究, (1): 17–26
张涛，龚六堂，卜永祥 (Zhang Tao, Gong Liutang, Bu Yongxiang) (2006). 资产回报、住房按揭贷款与房地产均衡价格 (On the asset return, mortgage lending and property price). 金融研究, (2): 1–11